

Symptom Prescription: Inducing Anxiety by 70% Exhalation¹

Erik Peper²

San Francisco State University

Merrie MacHose

Allentown, PA.

This study investigates the effects of partial exhalation to feelings of anxiety. Thirty five volunteer subjects (14 male, 21 female, mean age 40.6) were first trained in slow diaphragmatic breathing (SDB). Then subjects rated their anxiety levels on a scale from 1 (none) to 5 (extreme) in sequential conditions of SDB, 70% subjective exhalation, and SDB. During the 70% subjective exhalation phase, subjects were instructed to breathe and limit their exhalation to 70% of the inhaled volume during each consecutive breath. The 70% subjective condition significantly ($P < .0005$) increased subjects' anxiety levels as compared to the initial SDB baseline, while a return to SDB significantly reduced the anxiety levels. The 70% approach appears useful in demonstrating to the client that possible changes in breathing patterns can affect anxiety.

Descriptor Key Words: respiration; anxiety; symptom prescription; hyperventilation; biofeedback; breathing exhalation.

The relationship between feelings of anxiety and chronic hyperventilation syndrome has been noted in the psychophysiological literature by Lum (1983), Ley (1985), and Fried (1987). Hyperventilation has been behaviorally

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²Address all correspondence to Erik Peper, Ph.D., Institute for Holistic Healing Studies, San Francisco State University, San Francisco, California 94132.

described as rapid thoracic breathing frequently punctuated with sighs (Fried, 1987; Lum, 1983). This may consist of concurrent abdominal bracing, as in the fight-flight response, and the inhibition of the exhalation phase of respiration. Although the sensations of panic may be evoked by purposeful hyperventilation, normally the clients do not appear to breathe in that excessive pattern. Rather, they tend to breathe in a shallow manner. These dysfunctional breath patterns may contribute to numerous physical and emotional complaints (Lum, 1983; Nixon, 1989; Nixon & Freeman, 1988).

Whether the symptoms are behaviorally or cognitively induced, developing awareness with the ability to voluntarily trigger the previously conditioned symptom may be the first phase in clinical treatment. This process, known as symptom prescription, has been used to facilitate awareness and subsequent reduction of hyperventilation symptoms. The use of symptom prescription in the facilitation of autonomic training has been documented previously in the treatment of asthma (Peper, Smith, & Waddell, 1987), cardiac arrhythmias (Beecker & Engel, 1973), and behavior problems (Ascher, 1980). The purpose of this study was to explore whether sequential, incomplete exhalations (as opposed to overt hyperventilation) increases a subject's sense of anxiety. If so, would a return to easy diaphragmatic breathing reduce the felt sense of anxiety?

METHOD

Subjects

Subjects were 35 volunteers (14 males and 21 females, mean age 40.6 years) who attended a breath-training workshop for clinicians and who had learned slow diaphragmatic breathing (SDB). For two days subjects had learned SDB with incentive spirometer and EMG feedback. Generally, this meant that their tidal volume significantly increased, the abdomen diameter increased during inhalation and decreased during exhalation, the shoulder EMG activity (scalene and trapezius) did not increase during inhalation and their breathing rate decreased to four to seven breaths per minute. (Peper, 1988). Twenty-seven of the 35 subjects indicated previous self-experience with anxiety ranging from mild social anxiety to full panic attacks.

Procedure

During the pretrial, subjects were instructed to sit comfortably and to breathe in a slow diaphragmatic (SDB) manner for five to six minutes,

as described in Roland and Peper (1987). They breathed at their own rate as they had learned previously. They then indicated their subjective levels of anxiety at that time. A five-point scale indicating levels of anxiety was used with 1 indicating "none" and 5 indicating "extreme" anxiety. They were also instructed to describe their experience.

Next, the subjects were verbally instructed to continue to breathe easily but they were to exhale 70% of each sequential breath of the previously inhaled volume. This pattern continued for one to two minutes or until they became uncomfortable and had to stop. Although in theory this would lead subjects to become rapidly hyperinflated and hold their breath, in practice subjects tended to shift to shallow, very rapid thoracic breathing. *No actual measures were taken of the exhaled volume; the subjects' subjective experience was their guide.* The usual pattern consisted of increasingly shallow, rapid breathing followed by a sigh. Following this, subjects again indicated their anxiety levels on the same type of five-point scale and recorded their subjective experiences. This trial was followed by a post-SDB period of about five to six minutes, with subjects again indicating their anxiety levels and their subjective experiences.

RESULTS

The 70% subjective exhalation pattern significantly increased anxiety levels as compared to slow diaphragmatic breathing during the pre-SDB trial. To determine specifically which trials differed, the multiple comparisons procedure of Hollander and Wolfe (1973, p. 151) was used at the .05 level of significance ($S^* = 54.488$ [corrected for ties], $P < .00005$, $df = 2$). Table I gives descriptive statistics for the reported anxiety levels for the three trials.

Similarly, anxiety was significantly reduced during the post-SDB trial as compared to the 70%, trial. All subjects reported less anxiety during the POST-SDB trial than during the 70% trial.

Table I. Descriptive Statistics for Reported Anxiety Levels in the Three Trials ($N = 35$)

	Mean	Median	SD
Pre-SDB	1.8	2	.85
70% Exhalation	3.4	3	.60
Post-SDB	1.5	1	.59

Table II summarizes the subjective experiences described by the subjects during each trial. Table III details subjects' subjective experiences during the sequential 70% exhalation trial.

Table II. Summary of Subjects' Subjective Experiences During Each of the Breathing Trials

I. Slow diaphragmatic breathing
54 Decrease in arousal
4 Other
II. 70% Exhalation
57 Increase in arousal and symptoms
15 Difficulty with breathing
1 Other
III. Slow diaphragmatic breathing
53 Decrease in arousal
5 Decrease in symptoms

Table III. Frequency of Responses for Subjects' Subjective Experiences During 70% Exhalation

Increase in arousal and symptoms
9 Lightheaded/dizzy
8 Increase in anxiety/panic
7 Tension in face/neck shoulders/back
5 Discomfort/uncomfortable/ill at ease
4 Nervous sensation/uncomfortable in chest
4 Unable to relax/tense
3 Increase in heart rate/pounding
3 Mind more active/agitation
2 Quivering/jittery
2 Unbalanced/disoriented
2 Feeling flushed/tingling
8 Other (e.g., headache, tired, frustrated)
Difficulty with breathing
3 Breathless/out of breath
2 Could not take a deep breath
2 Pressured to breathe
2 Oxygen starved and choked up
2 Starving/gasping for breath
2 Ready to explode
1 Air backing up in lungs
1 Breathing shorter and shorter
Other
1 Calmer

Finally, one individual reported higher anxiety levels during the PRE-SDB trial than during the 70% condition. That is, this subject was less anxious during the disrupted breathing pattern than during the initial slow diaphragmatic trial. She reported that during the initial easy breathing trial, feelings of sadness and embarrassment arose. She also reported that awareness of unpleasant somatic sensations increased during this time. During the 70% exhalation phase her comment was that the experience was "like recognizing an old way of breathing to cut off feelings." This subject did, however, report a lower POST-SDB level than in either the PRE-SDB or 70% conditions.

DISCUSSION

Inhibiting the exhalation phase of expiration significantly increases subjects' subjective sense of anxiety. The subjective descriptions described by the subjects appear similar to those experiencing symptoms of hyperventilation. It appears that the disruption of easy breathing patterns significantly raised the sense of anxiety while a return to slow diaphragmatic breathing reduced the sense of anxiety. Even though the instruction asked subjects to exhale each sequential breath by 70% most subjects did not do this. Instead, they tended to breathe shallowly in their chests.

Although the subjective experiences seem to match those experienced during the hyperventilation syndrome, it is doubtful that this procedure actually produced hypoxemia. It appears to indicate that the anxiety induced by the 70% exhalation was most likely provoked by a sense of air hunger and the bracing patterns, which in turn, triggered the emotional reaction. The data suggest that the 70% exhalation strategy can effectively be used to rapidly increase anxiety levels as a symptom prescription technique. It is possible that the anxiety measure indicates general subject distress because only a single dimension was assessed. However, most subjects were surprised at the difference between the anxiety levels in the different conditions. One person commented: "I was very surprised by the power of the experience." This surprise facilitates cognitive awareness that different breathing patterns affect emotions — creating something of an "Aha!" effect.

Three subjects reported that their anxiety levels in the PRE-SDB and 70% conditions were the same; however, their POST-SDB anxiety levels show a reduction in anxiety. Possibly, the PRE-SDB condition did not provide sufficient time to allow the subjects to experience relaxation as a result of slow diaphragmatic breathing. These subjects may not have mastered the breathing technique; further disruption of the breathing pattern may have enhanced their awareness of physiological cues so that in the POST-

SDB trial the skill is improved, as evidenced by their report of a lowered anxiety level.

For 16 participants POST-SDB scores were lower than during the PRE-SDB trial, indicating that the symptom prescription technique may have facilitated their acquisition of the breathing skills. Their lowered post score may be similar to the rebound muscle relaxation that occurs after tightening and then letting go of the muscle contraction.

For those five cases in which POST-SDB scores were greater than during the PRE-SDB, most likely the duration of the POST-SDB trial was insufficient for these individuals to return to the original baseline level. Even so, they all experienced significantly less anxiety than during the 70% trial. Some individuals require longer practice periods to return to presymptom levels; therefore, this technique should be practiced with a therapist's guidance.

The power of the symptom prescription technique is illustrated by the one individual who experienced higher anxiety in the initial SDB trial. Although her anxiety level initially increased, it decreased steadily throughout the experiment. During the POST-SDB trial her anxiety level dropped below that of the PRE-SDB level. Her comments reveal that the experience enhanced her insight into the relationship between breathing patterns and feelings. Her final comment was that the experiment was a "good learning experience" as it identified the somatic pattern by which she shut emotions off.

A clinical implication from this study is that therapists need to be aware of how clients are breathing. Also, clients can become aware that symptoms may be brought on by breathing style and that they can control their experience by altering their breathing behavior.

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